

1. **Lesson1. For Teachers:** Please have the students read the sentences one at a time and correct their pronunciation of each sentence then have them repeat after you. Wait until after they read the sentence (use the number in place of the missing word) to have the students choose the correct answer to fill in the blank. When the students finish the article, move on to the further questions.

3[A] – Hubble Space Telescope



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2. When the U.S. space agency NASA finally launched the Hubble Space Telescope into orbit in 1990, astronomers throughout the world celebrated. The new telescope, considered by many to be the most sophisticated scientific instrument ever created, incorporated an enormous mirror capable of capturing light from the farthest reaches of space. The resulting images were expected to provide a glimpse into distant galaxies and yield information that could be used to reconstruct the early history of the universe. Astonishment was widespread, then, when the first pictures sent by the telescope were fuzzy and indistinct. Investigation revealed that the mirror, which had been designed with very precise specifications, had a tiny manufacturing flaw. In addition, to being an enormous disappointment to the scientific community, this failure dealt a serious blow to the status of NASA, which was still reeling from the tragic explosion of the space shuttle *Challenger* in 1986.

3. **Further Questions** *Ask student to answer the question on their own at first. If the student can't answer correctly, have him look at the last page and read the "example answer" for the question. Have the student try to memorize the answer, if it's too long or difficult, you should divide the sentence into 2 or 3 parts to make it easier to remember. Once they have memorized the answer, the teacher should ask the question one last time so that the student can practice answering. Also if you find any mistakes, please mark the page and let me know ASAP.

4. **1) Why did astronomers throughout the world celebrate in 1990?**

NASA launched the Hubble Space Telescope.

5. **2) What was the mirror of the Hubble Space Telescope capable of doing?**

It was capable of capturing light from the farthest reaches of space.

6. **3) Why were the first images fuzzy and indistinct?**

7. *The mirror, which had been designed with very precise specifications, had a tiny manufacturing flaw.*

The problem with Hubble arose because the optical engineers responsible for producing the mirror—and the company they worked for—had failed to detect a basic calibration mistake during testing. Further analysis revealed, however, that the true source of the problem was not fault engineering, but a systematic weakness in the organizational culture at NASA, which may also have contributed to the earlier Challenger disaster. Managers at NASA had put heavy pressure on contractors to stem ballooning costs and limit deadline delays, discouraging them from spending time checking for errors. This attitude resulted from the organization's desperate desire to avoid alienating Congress, the source of its funding, by going over budget or pushing back deadlines. Ultimately, NASA was stuck in a double bind. To attract support from scientists and the general public, it needed to undertake eye-catching, ambitious projects. Yet it was

obligated to expend as little as possible in doing so, and the more costs were cut, the greater the likelihood of failure.

8. **Further Questions** 

9. **4) What did the engineers do that caused the problem with Hubble?**

10. *The optical engineers responsible for producing the mirror—and the company they worked for—had failed to detect a basic calibration mistake during testing.*

5) Describe the systematic weakness in NASA.

11. *Managers at NASA had put heavy pressure on contractors to stem ballooning costs and limit deadline delays, discouraging them from spending time checking for errors.*

12. **6) What does NASA need to do to attract support from scientists and the general public?**

13. *It needs to undertake eye-catching, ambitious projects.*

14. It took three years and millions of dollars to send astronauts to repair the telescope. Only then did the instruments begin to live up to the legacy of its great namesake, Edwin Hubble, the American astronomer who laid the groundwork for contemporary space science by showing that the universe is expanding. In fact, the contributions of the science by showing that the universe is expanding. In fact, the contributions of the Hubble Space Telescope to scientific understanding have been so noteworthy that a successor is now in the works. NASA Administrator Charles Bolden believes this new telescope will open “horizons far greater” than those that the Hubble put within reach of science. Other Hubble comparisons, however, have not been so positive. In his investigative report on the cost overruns and missed deadlines that have dogged the new telescope since its inception, NASA Inspector General Paul Martin identified a “Hubble Psychology” pervading NASA as the source of the problems. He characterized this as “an expectation among NASA personnel that projects that fail to meet the cost and schedule goals will receive additional funding, and that subsequent scientific and technological success will overshadow any budgetary and schedule problems.” The agency, it seems, must plant its feet more firmly on the ground if its next-generation telescope is to make it to the heavens.

15. **Further Questions**

16. **7) Who was Edwin Hubble?**

17. *He was the American astronomer who laid the groundwork for contemporary space science.*

18. **8) What is the “Hubble Psychology”?**

19. *An expectation among NASA personnel that projects that fail to meet the cost and schedule goals will receive additional funding, and that subsequent scientific and technological success will overshadow any budgetary and schedule problems.*

20. ***Choose the correct answer from these choices.**

21. **(32)** How did the launch of the Hubble Space Telescope initially affect NASA's reputation?

- 1 The details of distant star systems transmitted by the instrument, though precise, were considered too insignificant to justify the cost.
22. **2** The sophistication and complexity of the instrument gave the agency's standing a slight boost in spite of a manufacturing error.
23. **3** The publicity surrounding the images it sent helped the agency recover from the damage it had suffered as a result of past failures.
24. **4** The fact that NASA had let a small but serious error occur reinforced the image of the agency that had begun to form after the *Challenger* accident.

25. **(33)** The "double bind" mentioned in the passage refers to

26. **1** contractors' discomfort at having to both ignore quality-control regulations and go against the wishes of Congress in order to comply with NASA's orders.
27. **2** NASA's attempt to publicize the cost-efficiency of Hubble's manufacture while having to pay excessively high fees to its contractors.
28. **3** the pressure on NASA's managers to follow governmental safety guidelines while simultaneously enforcing the agency's own policies.
29. **4** NASA's need to fulfill public expectations by carrying out appealing projects while limiting spending enough to maintain its political support.

30. **(34)** According to Paul Martin, what is at the root of the problem with the new telescope?

31. **1** The engineers' tendency to focus too much on Hubble as a point of comparison when conducting tests of the telescope's components.
32. **2** A belief among the developers that their inability to control costs and time will be overlooked if the telescope proves to be successful.
33. **3** Strong pressure from the public to build on the knowledge revealed by Hubble, regardless of how long it might take or how great the expense.
34. **4** A management culture that is overly concerned with avoiding associations between the new telescope and Hubble for fear of not receiving funding.

35. **Answers for "Further Questions"**



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4. *It was capable of capturing light from the farthest reaches of space.*

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7. **4) What did the engineers do that caused the problem with Hubble?**

1. *The optical engineers responsible for producing the mirror—and the company they worked for—had failed to detect a basic calibration mistake during testing.*

5) Describe the systematic weakness in NASA.

2. *Managers at NASA had put heavy pressure on contractors to stem ballooning costs and limit deadline delays, discouraging them from spending time checking for errors.*
3. **6) What does NASA need to do to attract support from scientists and the general public?**
4. *It needs to undertake eye-catching, ambitious projects.*
5. **7) Who was Edwin Hubble?**
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